DOCUMENT RESUME

ED 466 476 TM 034 215

AUTHOR Betebenner, Damian; Howe, Ken
TITLE Implications for Use of the ACT within the Colorado Student Assessment Program.
INSTITUTION Colorado Univ., Denver. School of Education.
SPONS AGENCY Colorado State Dept. of Education, Denver.
PUB DATE 2001-12-15
NOTE 22p.
PUB TYPE Reports - Evaluative (142)
EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS Academic Achievement; Accountability; *College Entrance Examinations; High Schools; *State Programs; Student Evaluation; *Test Use; *Testing Programs
IDENTIFIERS *American College Testing Program; Colorado; *Colorado Student Assessment Program

ABSTRACT

This study was commissioned to investigate issues related to the inclusion of the American College Testing Program (ACT) assessment within the Colorado State Assessment Program (CSAP). Analyses were carried out using assessment materials, assessment results, and various data from the ACT and the Colorado State Department of Education. One focus of the investigation was the match between the Colorado Model Content Standards (CMCS) and the ACT Assessment. Data indicate that the ACT does not match well with the CMCS, and the match is especially poor in science. This finding casts doubts on the advisability of requiring all Colorado 11th graders to take the ACT. The poor match could potentially inject incoherence into the CMCS-based accountability program as a whole, and it raises questions about how ACT results might be combined with CSAP performance in the calculation of Student Accountability Reports for high schools. (SLD)

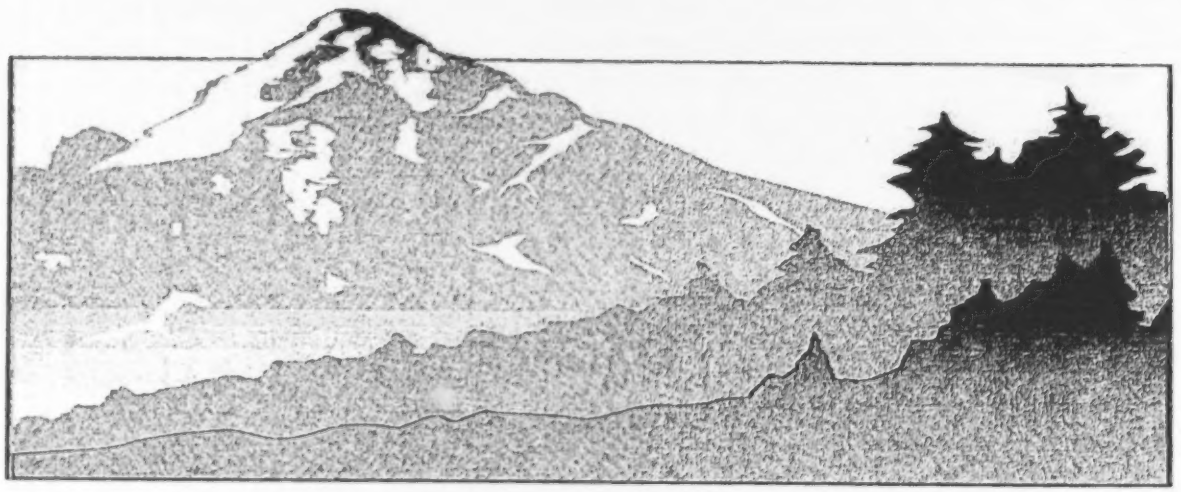
Reproductions supplied by EDRS are the best that can be made
from the original document.

TM

ED 466 476

COLORADO

IMPLICATIONS FOR USE OF THE ACT WITHIN THE COLORADO STUDENT ASSESSMENT PROGRAM



Damian Betebenner and Ken Howe
School of Education
University of Colorado
Boulder, CO

December 15, 2001

CSAP

TM034215

PERMISSION TO REPRODUCE AND DISSEMINATE THIS MATERIAL HAS BEEN GRANTED BY

D. Watson

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)

1

2

U.S. DEPARTMENT OF EDUCATION
Office of Educational Research and Improvement
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)

☑ This document has been reproduced as received from the person or organization originating it.

☐ Minor changes have been made to improve reproduction quality.

• Points of view or opinions stated in this document do not necessarily represent official OERI position or policy.

BEST COPY AVAILABLE

Executive Summary

The study described here was commissioned by the Colorado Department of Education (CDE). Its purpose, as elaborated in RFP-MR-ASMT-0001, is to investigate issues related to the inclusion of the ACT assessment within the Colorado State Assessment Program. Findings are reported in six categories:

- A statistical summary of the ACT assessment during the 1998-99, 1999-00, and 2000-01 school years for 11th graders in the state of Colorado.
- An analysis of how well the ACT assessment measures content knowledge in reading, writing, mathematics, and science as defined for grades 9-12 in the Colorado Model Content Standards (CMCS).
- A comparison of the ACT to the SAT I and the SAT II with respect to the CMCS.
- An examination of the costs associated with the development of 11th grade Colorado State Assessment Program (CSAP) exams in reading, writing, mathematics, and science.
- A comparison of diagnostic reporting between the ACT and the CSAP exams.

These analyses were carried out using assessment materials, assessment results, and various data defined in the body of the report and supplied by ACT Inc. and CDE.

Summary results for the ACT Results for 11th graders taking the ACT during the 1998-99, 1999-00, and 2000-01 academic years show that those juniors taking the exam during the first two academic years are a select group, with their means close to 1 point above the state graduating class mean of 21.5. With the inclusion of all juniors in 2000-01, the mean drops nearly two points below the state graduating class average to 19.6. When data were disaggregated by gender and ethnicity, similar decreases in mean ACT composite scores were noted with the inclusion of all juniors in 2000-01.

The ACT assessment as a measure of the CMCS Using assessment frameworks for the 10th grade CSAP exams in reading, writing, and mathematics and the CMCS in science, all items on two retired ACT assessments were mapped to the CMCS standard that they best fit. Using the 10th grade CSAP exams as exemplars of tests meeting the CMCS, we found that the ACT tests fell short of being tests of whether students understood the CMCS. The worst performing test in this regard was the ACT science reasoning test, which fails to assess the advanced science content present in the CMCS.

The ACT mathematics, reading, and writing tests better matched the content dictated by the CMCS than the science reasoning test but fell short in a number of areas compared to the exemplar 10th grade CSAP examinations in mathematics, reading, and writing. Specifically, the ACT and CSAP tests showed different emphases on the CMCS standards comprising each of the subject areas. There were also differences among ACT and CSAP test items that mapped to the same standard. The CSAP items were often more demanding than their ACT counterparts, requiring students to go beyond just finding the right answer to also explain their answers in written form.

Alternates to the ACT assessment There are currently two alternates to the ACT assessment in widespread use: the SAT I and SAT II. Unlike the ACT assessment, the SAT I is not curriculum based and would likely be a worse match than the ACT to the CMCS. Unlike the SAT I, the SAT II achievement tests are curriculum based. It is unclear whether they would map to the CMCS better than the ACT. Unlike the ACT and SAT I, which serve as the admissions tests to the majority of colleges and universities in the United States, the SAT II tests are usually only required at elite schools and *in conjunction with* either the ACT or SAT I.

Costs associated with the development of 11th grade CSAP exams The estimated costs associated with the development of the 11th grade CSAP exams in reading, writing, science, and mathematics for 45,000 students provided by CTB/McGraw-Hill are $4,600,000 in the first year and $3,900,000 in subsequent years. By comparison, the price charged by ACT Inc. for administration of the ACT in 2001 is $23 per student resulting in total costs of $1,035,000.

Diagnostic reporting associated with the ACT assessment and CSAP exams The diagnostic reports associated with the ACT and CSAP exams differ in two important respects:

1. Diagnostic reports for the CSAP exam provide performance level results to students, school, and districts that are clearly tied to the CMCS. The ACT diagnostic

reports, both for students and schools, provide composite score data, scores on each of the four tests, and scores on subareas tested within each test. Normative data is also supplied to help interpret the scores.

2. The school, district, and state reports for the ACT are given for the graduating class whereas the CSAP reports provide information on students taking the test during the previous academic year.

Conclusions The ACT does not match well with the CMCS, and the match is especially poor in science. This finding casts serious doubt on the foremost rationale for requiring all Colorado 11th graders to take the ACT, namely, that the ACT provides a good measure of how well students have mastered the CMCS. It should be noted that several other rationales are not impugned by the finding of a poor match between the ACT and the CMCS. These rationales are (1) that requiring all Colorado 11th graders to take the ACT might encourage more students to pursue a college education and (2) that taking the ACT in their junior years might help students identify deficiencies that they might remedy in their senior years.

That the ACT is poorly matched with the CMCS has two further implications: First, it potentially injects incoherence into the CMCS-based accountability system as a whole. Because the CSAPs and the ACT measure different things, they are potentially at cross purposes. That is, teaching that concentrates on increasing performance on the CSAP exams could come at the cost of lowering performance on the ACT, and vice versa. Second, and related to the first problem, the poor match raises serious question about how ACT results might be combined with CSAP performance in the calculation of Student Accountability Reports for high schools. Because the reports are finely tuned to provide information related to performance on the CMCS, it is unclear how to amend the reports' format to include ACT performance without reducing the reports' focus on performance with respect to the CMCS.

One important finding pertaining to an issue that was not included in the original aim of the study emerged through the process of data analysis. In particular, the 2002 ACT graduating class summary will indicate a decrease of approximately 2.5 points compared to 2001. This is an outcome of the manner in which ACT Inc. reports results coupled with all Colorado juniors being required to take the exam in 2001 (placing them in the 2002 graduating class). This decrease should be interpreted with some caution since it is largely the result of a different population of students in Colorado taking the ACT. Comparisons to previous Colorado ACT graduating class results or to other states' ACT results based upon self-selecting ACT examinees are tenuous.

Introduction

This report was commissioned by the Colorado Department of Education (CDE) in accordance with RFP-MR-ASMT-0001 (hereafter referred to as RFP) to investigate issues related to Senate Bill 00-186, which mandates that all 11th grade students in Colorado take the ACT. This report includes analyses outlined in the proposal submitted by the authors of this study in response to the RFP.

The ACT Assessment (hereafter referred to as the ACT) is a curriculum-based exam developed and administered by ACT Inc. It consists of four tests, English, mathematics, reading, and science reasoning. The test's primary use is as an entrance exam for colleges and universities throughout the United States. With the passage of Senate Bill 00-186, all 11th grade students in the state of Colorado, except in a few special circumstances, are required to take the ACT in the spring of their junior year. Prior to 2001, the exam was largely voluntary with a few schools opting to pay for the ACT to be administered to all their students.

CDE currently administers the Colorado State Assessment Program (CSAP) with exams constructed in accordance with the Colorado Model Content Standards (CMCS). As of the 2001-2002 school year, exams are given to various grades in various content areas. The schedule associated with the CSAP is presented in Table 1.

Grade 3	Reading and writing
Grade 4	Reading and writing
Grade 5	Reading, writing, and mathematics
Grade 6	Reading, writing, and mathematics
Grade 7	Reading, writing, and mathematics
Grade 8	Reading, writing, mathematics, and science
Grade 9	Reading, writing, and mathematics
Grade 10	Reading, writing, and mathematics
Grade 11	ACT

Table 1: CSAP exam schedule for grade 3 to 11 with associated subjects

The CSAP exams given in grades 3 through 10 are developed by CTB/McGraw-Hill and are specifically designed to assess student mastery of designated subject matter as defined within the CMCS. The ACT, on the other hand, is not constructed to the CMCS but instead uses the Educational Planning and Assessment System (EPAS) standards developed by ACT Inc. as its template. This study was commissioned to investigate issues related to the use

of the ACT assessment as a measure of the CMCS in reading, writing, mathematics, and science.

As outlined in the proposal offered in response to the RFP, this report presents results of an investigation of issues related to the use of the ACT assessment in the following six categories:

- A statistical summary of ACT assessment results during the 1998-99, 1999-00, and 2000-01 school years for 11th graders in the state of Colorado.
- An analysis of how well the ACT assessment measures content knowledge in reading, writing, mathematics, and science as defined for grades 9-12 in the CMCS.
- A comparison of the ACT to the SAT I and the SAT II with respect to the CMCS.
- An examination of the costs associated with the development of 11th grade CSAP exams in reading, writing, mathematics, and science.
- A comparison of diagnostic reporting between the ACT and the CSAP exams.

Summary of ACT data for years 1998-99, 1999-00, and 2000-01

This section examines the results on the ACT examination for 11th graders during the 1998-99, 1999-00, and 2000-01 academic years. Because Senate Bill 00-186 requires all 11th grade students to take the ACT beginning in spring 2001, summary results of the 2000-01 ACT data on juniors is not comparable to the previous two academic years, when juniors taking the test did so voluntarily.[1] Moreover, the 2000-01 data includes only those juniors taking the test during the mandatory dates. The summary results reported include number of 11th grade students taking the ACT, mean, median, and standard deviation of the ACT composite scores. The data used for these analyses included only valid scores as reported to us by ACT Inc. In 2000-01, juniors absent and without a legitimate exemption from the ACT received scores of zero. Differences in results reported here and those available on the CDE website are largely attributable to this difference in accounting for absentees. In addition to statewide results for juniors in each of the three academic years, results are disaggregated by gender, ethnicity, school, and district. Data used for the analyses described in this section were provided by ACT Inc. and CDE.

[1] Some schools during the 1998-99 and 1999-00 academic years provided for all of their students to take the ACT at school expense during a schoolwide administration. Results for these students are included in the 1998-99 and 1999-00 ACT data and summary analyses.

Year	ACT Composite score summary	
1998-99	mean	22.50
	median	22.00
	std. dev.	4.79
	number tested	8,381
1999-00	mean	22.42
	median	22.00
	std. dev.	4.78
	number tested	9,912
2000-01	mean	19.63
	median	19.00
	std. dev.	5.09
	number tested	41,358

Table 2: Statewide summary statistics for 11th grade ACT takers by academic year

Statewide results

Results for 11th grade students are presented in Table 2. The decrease in the mean in 2000-01 is clearly indicative of a different set of juniors taking the test than in the previous two years. Those students taking the ACT as juniors in 1998-99 and 1999-00 are likely high achievers who take the test early. The 11th graders taking the ACT in spring 2001 includes a similar group of high achievers together with students who would have taken the ACT as seniors as well as those students who likely would have never taken the ACT. The increase in standard deviation to 5.09 in 2000-01 indicates a more diverse group taking the exam.

Results by gender and ethnicity

The results from Table 2 disaggregated by gender and ethnicity are presented in Tables 3 and 4, respectively. For each gender, the results follow the same pattern as in Table 2: When all juniors are tested in 2000-01, the mean and median scores decrease. The same holds true with respect to ethnicity. Interestingly, whereas in 1998-99 and 1999-00 males outperformed females, in 2000-01, females scored higher than males.

Year	Gender	ACT Composite score summary	
1998-99	Female	mean	22.38
		median	22.00
		std. dev.	4.72
		number tested	4,600
	Male	mean	22.67
		median	23.00
		std. dev.	4.87
		number tested	3,723
1999-00	Female	mean	22.30
		median	22.00
		std. dev.	4.70
		number tested	5,406
	Male	mean	22.57
		median	22.00
		std. dev.	4.87
		number tested	4,423
2000-01	Female	mean	19.80
		median	19.00
		std. dev.	4.95
		number tested	20,766
	Male	mean	19.47
		median	19.00
		std. dev.	5.22
		number tested	20,408

Table 3: Statewide summary statistics for 11th grade ACT takers by academic year and gender

Year	Ethnicity	ACT Composite score summary	
1998-99	African American	mean	19.06
		number tested	181
	Native American	mean	20.66
		number tested	41
	White	mean	22.86
		number tested	6,463
	Hispanic	mean	19.40
		number tested	565
	Asian American	mean	23.08
		number tested	242
	Other	mean	21.28
		number tested	304
1999-00	African American	mean	18.78
		number tested	193
	Native American	mean	21.00
		number tested	56
	White	mean	22.88
		number tested	7,523
	Hispanic	mean	19.19
		number tested	756
	Asian American	mean	22.11
		number tested	311
	Other	mean	21.02
		number tested	396
2000-01	African American	mean	16.46
		number tested	1,174
	Native American	mean	17.93
		number tested	412
	White	mean	20.78
		number tested	22,859
	Hispanic	mean	16.49
		number tested	4,415
	Asian American	mean	19.64
		number tested	1,207
	Other	mean	18.91
		number tested	2,053

Table 4: Statewide summary statistics for 11th grade ACT takers by academic year and ethnicity

Year	School/District	ACT Composite mean	
		Minimum	Maximum
1998-99	School ($N = 123$)	15.16	25.58
	District ($N = 58$)	18.45	25.16
1999-00	School ($N = 139$)	14.84	25.79
	District ($N = 67$)	18.11	25.58
2000-01	School ($N = 271$)	13.72	26.30
	District ($N = 143$)	14.68	23.06

Table 5: Statewide ACT composite score ranges for 11th grade ACT takers by school and district

Results by school and district

Eleventh grade results aggregated by school and district are presented in Table 5. In line with ACT results disseminated by CDE, results presented are for schools/districts with more than 15 reported scores for 11th graders. In comparing school level summaries based upon data supplied by ACT Inc. in 2000-01 to those available from CDE, significant discrepancies exist that could not be reconciled. For example, the school level summary available from CDE provides results for the Adult Education/Lincoln Center indicating 76 tested students with a mean of 3.61. The lowest *individual* score in the data provided by ACT Inc. was 4. Upon consultation with CDE, the discrepancies are the result of absentee test takers being assigned a score of 0 by CDE. Of the approximately 40,000 juniors taking the ACT in 2001, there were 2,000 students who were absent who were assigned scores of 0. This results in state means of these junior ACT takers of 19.6 to 18.5, from ACT Inc. and CDE, respectively.

ACT alignment with the Colorado Model Content Standards

The most important aspect of this study is its investigation of whether the ACT is an appropriate assessment to determine the extent to which students, schools, districts, and the state overall are meeting the CMCS. The CSAP tests administered in grades 3 through 10 are specifically designed to test the performance of students against these standards. The ACT is not designed according to these exact standards and thus some question exists as to whether the ACT can serve as an assessment of the CMCS. This section presents our

findings with respect to this question.

ACT Inc. investigated this question in their own study and found that the ACT can indeed serve as a measure of how well students are performing with respect to the CMCS in all of the four areas that the ACT tests: mathematics, writing (English), reading, and science reasoning (American College Testing (ACT), 2001). Because our study comes to different conclusions, it bears mentioning how the ACT Inc. study came to those conclusions and why we believe that those conclusions are dubious.

In addressing the question of how well the ACT measures achievement on the CMCS, the ACT Inc. study investigated the relationship between the ACT and the CMCS in two steps. First, the CMCS are identified which are either "directly" or "indirectly" measured by the ACT (ACT, 2001, p. 14). Second, standards on which the ACT assessment is based are identified which represent "explicit" or "implied" prerequisite skills defined in the CMCS (ACT, 2001, p. 14). In our opinion, this method of matching the ACT framework to the CSAP framework is liable to an unacceptable level of imprecision and, thus, *translation error*. First, how to determine what is measured "indirectly" or is "implied" is nowhere explained. Second, the ACT items themselves are not examined to determine how well they exemplify (or fail to) the CMCS. Our study uses the approach of mapping ACT items individually to CMCS standards. The details of how this was done are provided next.

Method

To address how well ACT items map to CMCS standards, we began by first specifying exactly which standards to attempt to map to. Using the 2001 10th grade CSAP tests in reading, writing, and mathematics as our model (since those tests are designed according to the CMCS), we acquired from the CDE website the assessment frameworks associated with each of the three CSAP exams. These frameworks enumerate what students are expected to know and be able to do. In addition, the three CSAP exams are mapped onto this framework allowing us to compare how well the reading, writing (English), and mathematics tests of the ACT correspond to the three corresponding CSAP exams in terms of emphasis and inclusion/exclusion of standards. Since science is only tested in the 8th grade, no assessment framework exists for 10th grade science. In order to address how well the ACT science reasoning test maps to the science CMCS, we used the science CMCS themselves as the assessment framework.

Using two retired ACT assessments provided by ACT Inc., four subject matter specialists were employed to map the items onto the assessment frameworks. The item mappers were instructed to associate with each item, if possible, the most specific standard available in the associated 10th grade assessment framework. In cases where an item addressed more than one standard, the item mapper was instructed to note the standards and rank according to which

standard is most clearly addressed. To cross-validate the specialist's decisions, the science and mathematics specialists mapped a random sample of the mathematics and science items while the reading and writing specialists mapped a random sample of the writing and reading items to the CMCS. When there were disagreements between the mathematics and science specialists, the disagreements were easily reconciled after discussion. Disagreements between the reading and writing specialists proved more cumbersome. It proved more difficult to apply the CMCS in reading and writing to the ACT items and this difficulty manifest itself in more disagreements between the two specialists. In all instances the disagreements were reconciled and a best standard, if one existed, was determined. In total, 120 ACT mathematics items, 150 writing items, 80 reading items, and 80 science reasoning items were mapped from the two ACT exams.

Results

Upon examination of the item mapping of the science reasoning test, it quickly became apparent that the science reasoning test of the ACT could not be mapped onto the high school CMCS for science. The science reasoning test incorporates very little in terms of advanced science content, whereas the CMCS standards in science dictate that students should know very specific and advanced science content in both the physical and life sciences. This finding of a mismatch between the ACT test and the standards is at odds with what was found in the ACT Inc. study which asserted that, "[t]he EPAS Science Reasoning Tests match well with the standards and benchmarks described in the CMCS" (ACT, 2001, p. 5).

For the other three exams item mapping results were entered into a spreadsheet to facilitate the calculation of basic frequencies. Frequencies for the corresponding 10th grade CSAP exams were calculated from item maps available on the CDE website. The results are summarized for the mathematics, reading, and writing tests of the ACT in Figure 1.[2] It should be noted that those items falling within the *no standard* category do so because they failed to address any standard in the assessment frameworks for the 10th grade CSAP. In a number of cases, an item could be mapped onto a standard more elementary than a 10th grade standard (i.e., the item addressed a 9th or 8th grade standard). This fact will be elaborated on shortly.

The first two bar charts in Figure 1 demonstrate that the mathematics and reading tests of the ACT have different emphases than the corresponding 2001 10th grade CSAP exams. Within the mathematics test, for example, the largest discrepancies occurred with standards

[2]The standards associated with the assessment frameworks in each subject area were subdivided beyond what is depicted in Figure 1. For example, there is a standard 2.2a in mathematics. Because of the small numbers of items in each of sub-standards, aggregates were considered to give a better overall impression of the emphasis of each test.

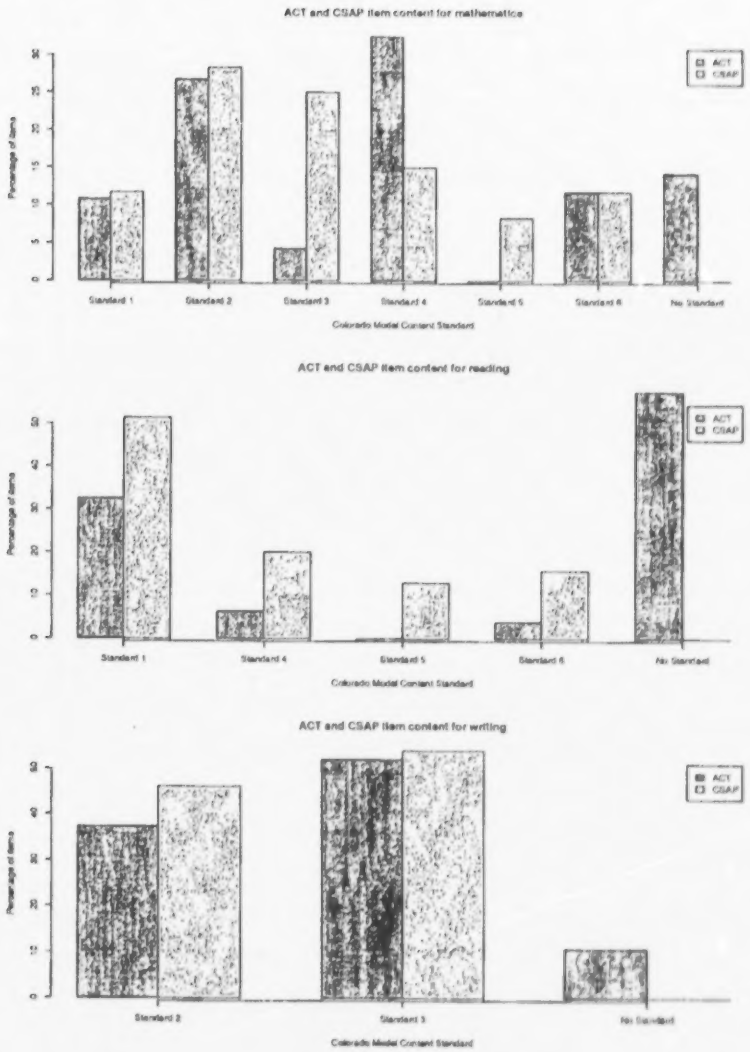


Figure 1: Bar charts depicting emphasis on the CMCS for the ACT tests and the corresponding 2001 10th grade CSAP exam

3, 4, and 5. Standard 3 emphasizes discrete math in the form of data collection and analysis, statistics, and probability; topics which are not taught to a number of high school students and which are thus inappropriate for inclusion on the ACT mathematics test. Standard 5 includes topics involved with measurement in real-world problems making it difficult to address with single multiple-choice items like those present in the ACT mathematics test. The omission of items addressing standards 3 and 5 is then reflected in the heavy emphasis on items which address standard 4, student understanding of geometric concepts, properties, and relationships.

Of the three ACT tests for which frequencies were tabulated, the ACT reading test had the most items for which no 10th grade reading standard applied. Fifty-eight percent of the 80 reading items examined failed to match a 10th grade standard. A large majority of these items did, however, map to a 9th grade standard. Sixty-seven percent of the items that failed to map to a 10th grade standard did map to a 9th grade reading standard, most often standard 1.

The English (writing) test of the ACT provided the best match with the CMCS in terms of emphasis. This is partly due to the fact that there are only two writing standards in the CMCS assessment framework for 10th grade writing. The items of the 10th grade CSAP writing exam were almost evenly split between the two standards while 37 percent of the ACT items mapped to standard 2 and 52 percent to standard 3. Eleven percent of the ACT items matched no standard.

The preceding analyses delineate the emphases of the ACT and CSAP exams with respect to the CMCS but gloss over other important differences between the two exams. Foremost, the difference between the ACT tests and the CSAP mathematics, reading, and writing tests is a difference in the demands of many of the items. All four of the CSAP exams include open-ended response items which require the student to convey their thinking in written form. All items on the ACT assessment are multiple choice format. This requirement places greater demands on the student to demonstrate their knowledge and results in a more difficult exam; one cannot resort to eliminating multiple choice options to answer an open-ended response question. Stated succinctly, *all test items are not created equal*, even if they do address the same standard.

Even when comparing multiple choice items, there was a noticeable difference between the difficulty of the items present on the two exams. This became quite apparent when attempting to map ACT mathematics items to the CMCS. A number of items fit a standard, but did so in a less rigorous fashion. For example, math standard 2.2a states that students should be able to represent functional relationships using written explanations, tables, equations, and graphs and describe the connections among these representations. Examples of an ACT and CSAP mathematics item fitting this standard are presented in Figures 2 and 3, respectively.

How many ordered pairs (x, y) of real numbers will satisfy the equation $2x - 5y = 6$?

F. 0

G. 1

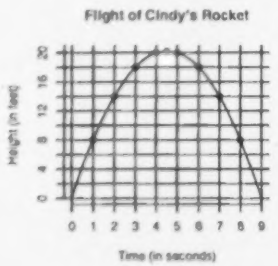
H. 2

J. 3

K. Infinitely many

Figure 2: A sample ACT mathematics item addressing mathematics standard 2.2a

The graph below shows the height of Cindy's model rocket during the course of its flight.



Which of these equations can be used to find the height of the rocket at any time during its flight?

A. $y = 9x$

B. $y = x^2 - 81$

C. $y = -x^2 + 9x$

D. $y = 9 - 9x^2$

Figure 3: A released item on the 10th grade mathematics CSAP bookmarked at the proficient level addressing mathematics standard 2.2a

Though the items address the same standard, the ACT item is not as demanding. The CMCS in mathematics dictate that students should be able to solve "real world" problems in a number of mathematical contexts. The contrast between the two examples in Figures 2

and 3 exemplifies the "real world" emphasis found in many CSAP mathematics items that isn't found in most ACT items. The emphasis on the "real world" application of mathematics in the CMCS and the 10th grade CSAP examination leads to the inclusion of many more dreaded story problems for students to solve. In short, meeting the CMCS in mathematics requires a robust understanding of the subject matter.

Alternates to the ACT

Use of college entrance examinations in the United States began at Harvard in the early 1930s and has grown to the point where nearly every college and university in the country requires students to take some test as part of the admissions process. Currently there are three exams which predominate: The ACT, the SAT I, and the SAT II.[3]. The utility of these exams lies in their ability to predict the first semester GPAs of entering freshmen (i.e., predictive validity) which is generally considered a good indicator of college success (Astin, 1971). Though the tests are used in a similar fashion, the tests are constructed to different specifications which merit discussion when considering alternates to the ACT assessment for 11th graders in Colorado.

The most important difference between the three tests is that the ACT and SAT II are curriculum based and purport to measure student mastery of skills learned in school and necessary for success in college studies. By way of contrast, SAT I is an aptitude test whose content is not always associated with what one is expected to encounter in high school studies. This difference is most apparent on the SAT I verbal exam which includes several analogy items (i.e., a is to b as c is to ?). Items of this type do not map onto the CMCS making it almost a certainty that were a study to be conducted which looked at how the SAT I verbal items mapped to the CMCS, the SAT I would perform much more poorly. Moreover, because the SAT I math exam tests math knowledge up to and including geometry, the SAT I is highly likely to do worse than the ACT (which includes more advanced mathematics up to and including trigonometry) when looked at in the context of the CMCS. Thus, switching from the ACT to one (or both) of the other two exams would likely yields no appreciable benefit in terms of getting a better match with the CMCS.

[3]The SAT II achievement tests for assessing knowledge in specific subject areas are required *in addition to* either the ACT or SAT I at some elite universities

Costs associated with development of 11th grade CSAP exams in reading, writing, mathematics, and science

Estimates of costs involved with the development of an 11th grade CSAP exam are provided by CTB/McGraw Hill, the contractor for the CSAP exams administered in grades 3 to 10. The following estimates include costs associated with the development of the four exams, scoring of the exams, and the reporting of exam results. The costs are based upon administration of the exams to 45,000 students. These costs represent payment to CTB/McGraw Hill for services they provide and do not included expenses incurred by other parties to administer the exams.

First year of test $4,600,000 which includes $1,500,000 for development of the four exams

Subsequent years $3,900,000 which includes $800,000 to produce 25 percent new items each year

By way of contrast, the state of Colorado is charged the national fee by ACT Inc. for any students accounted for in state testing. According to data supplied by ACT Inc., the cost per student in 2001 was $23. Using the same estimate of 45,000 11th grade students, ACT administration costs total $1,035,000. Again, these costs represent payment to ACT Inc. for services they provide and do not include expenses incurred by other parties to administer the exams.

Diagnostic reporting between the ACT and CSAP

Individual diagnostic reports

ACT Individual students are sent a report indicating their results on the ACT assessment. These results include a composite ACT score, four ACT test scores, one each for English, mathematics, reading, and science reasoning, and 7 subscores: two subscores for English, in usage/mechanics and rhetorical skills; three subscores for mathematics, in pre-algebra/elementary algebra, intermediate algebra/coordinate geometry, and plane geometry/trigonometry; and two subscores for reading, in social studies/sciences and arts/literature. In addition to the these scores, students are informed of the percent of college bound students at or below their given score level. The ACT diagnostic report provides no information on performance with respect to the CMCS.

CSAP Students receive a student diagnostic report in each of the subject areas in which they are tested. The report includes an indicator of the student's overall performance level in terms of one of four performance categories: unsatisfactory, partially proficient, proficient, and advanced. In addition, the report provides a scale score associated with the overall performance level, with scale score intervals defined for each of the four performance categories. Lastly, the report breaks down the overall performance level by content standard and subcontent area. The reports indicate whether the student's performance was either below proficient or proficient or above in each of the content standards and subcontent areas. Unlike the ACT, no normative data is supplied with the report. Because of it's design, the reports clearly indicate how well the performance matches up with the CMCS.

School level diagnostic reports

ACT ACT provides schools with a diagnostic report that indicates to school administrators the percentage of students falling into six score ranges (1 to 15, 16 to 19, 20 to 23, 24 to 27, 28 to 32, and 33 to 36) in each of the four areas tested by the ACT. These percentages are juxtaposed to analogous values tabulated for the state in which the school resides, and to the nation overall. Again, because the ACT doesn't map well onto the CMCS, inferences about how well the school is meeting the CMCS are not possible.

It is important to note that the ACT report is for the *graduating class* of that year, *not* the students taking the ACT during the previously concluded academic year. If a student took the ACT during their junior year, their score is not summarized at the school level until after their senior year, when they became a member of the graduating class. Thus, the results presented in ACT diagnostic reports at the school level do not represent the results for students at a particular grade level. Though, overall, most students taking the ACT are seniors, their results are combined with the juniors' results from the previous academic year, the sophomores' results from two academic years prior, etc. This differs from the way the CSAP exams aggregate student results, where results are reported for same grade level and the same academic year.

CSAP CDE provides schools and districts with a diagnostic report that includes, for each subject and grade level, district percentages/counts of students at each of the four CMCS performance levels, as well as the percentage/count of students for which no score was reported. These percentages/counts are then disagregated by gender, race, handicapping condition, accommodations, program (i.e., IEP, 504 plan, and Title I),

time in district, time in school, migrant status, and language background. The students with no scores (both for the district and for each individual school in the district) are indicated in one of five categories: Does not read English or Spanish; Individualized standards; Parental refusal; One or more test sessions invalid; One or more test sessions incomplete. In addition, schools are provided with a list of individual student performance indicating each student's score, performance level, and whether the student performed below proficient or at/above proficient on each of the CMCS content standards for the specific subject being tested. Like with the individualized CSAP reports, the design of the diagnostic report clearly links to CMCS performance.

Conclusions

The ACT does not match well with the CMCS, and the match is especially poor in science. This finding casts serious doubt on the foremost rationale for requiring all Colorado 11th graders to take the ACT, namely, that the ACT provides a good measure of how well students have mastered the CMCS. It should be noted that several other rationales are not impugned by the finding of a poor match between the ACT and the CMCS. These rationales are (1) that requiring all Colorado 11th graders to take the ACT might encourage more students to pursue a college education and (2) that taking the ACT in their junior years might help students identify deficiencies that they might remedy in their senior years.

That the ACT is poorly matched with the CMCS has two further implications. First, it potentially injects incoherence into the CMCS-based accountability system as a whole. Because the CSAPs and the ACT measure different things, they are potentially at cross purposes. That is, teaching that concentrates on increasing performance on the CSAP exams could come at the cost of lowering performance on the ACT, and vice versa. Second, and related to the first problem, the poor match raises serious question about how ACT results might be combined with CSAP performance in the calculation of Student Accountability Reports for high schools. Because the reports are finely tuned to provide information related to performance on the CMCS, it is unclear how to amend the reports' format to include ACT performance without reducing the reports' focus on performance with respect to the CMCS.

One important finding pertaining to an issue that was not included in the original aim of the study emerged through the process of data analysis. In particular, the 2002 ACT graduating class summary will indicate a decrease of approximately 2.5 points compared to 2001. This is an outcome of the manner in which ACT Inc. reports results coupled with all Colorado juniors being required to take the exam in 2001 (placing them in the 2002 graduating class). This decrease should be interpreted with some caution since it is largely

the result of a different population of students in Colorado taking the ACT. Comparisons to previous Colorado ACT graduating class results or to other states' ACT results based upon self-selecting ACT examinees are tenuous.

References

American College Testing. (2001). *Colorado Model Content Standards combined with ACT's EPAS assessments* (Tech. Rep.). Iowa City: American College Testing Program.

Astin, A. W. (1971). *Predicting academic performance in college.* New York: Free Press.

TM034215

U.S. Department of Education
Office of Educational Research and Improvement (OERI)
National Library of Education (NLE)
Educational Resources Information Center (ERIC)

ERIC®

NOTICE

Reproduction Basis

☒ This document is covered by a signed "Reproduction Release (Blanket)" form (on file within the ERIC system), encompassing all or classes of documents from its source organization and, therefore, does not require a "Specific Document" Release form.

☐ This document is Federally-funded, or carries its own permission to reproduce, or is otherwise in the public domain and, therefore, may be reproduced by ERIC without a signed Reproduction Release form (either "Specific Document" or "Blanket").